

CLAIMS

1. Membrane body (1) comprising at least one sailcloth (14) provided with at least one pair of panels (10, 11) connected together in an adhesive manner by respective faces (12, 13) facing one another; characterised in that it comprises, for each said sailcloth (14), at least one flexible sheath (15) arranged between said respective panels (10, 11) along a force line (F) set to house a corresponding tie rod (16) in a longitudinally free manner; 5 said tie rod being able to resist a dual tensile membrane stress acting on each said sailcloth (14), and keeping during use each said sailcloth (14) flexible and the corresponding said panels (10, 11) substantially free of tension; each said face (12) (13) having increased 10 wettability, through the application of a Corona treatment, or the like..

2. Membrane body (1), comprising at least one pair of panels (10, 11) connected together in an adhesive manner by respective faces (12, 13) and a plurality of tie rods (16) arranged stably between the panels (10, 11) according to a set pattern; each said tie rod (16) having respective end portions (17, 18); characterised in that it comprises insulation means (15) associated with each said tie rod (16) to leave said tie rod (16) longitudinally free 20 between said panels (10, 11); said tie rod (16) being suitable for resisting a dual tensile membrane stress acting on each of said pair of panels (10, 11), and keeping said panels (10, 11) substantially free of tension during use; each said face (12) (13) having increased wettability, 25 through the application of a Corona treatment, or the like.

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3. Membrane body (1) comprising at least one sailcloth (14) comprising at least one panel (10) (11); characterised in that it comprises, for each said sailcloth (14), at least one flexible sheath (15) connected in an adhesive manner to 5 said panel (10) (11) at a respective face (12) (13) along a set force line (F), to house within itself a corresponding tie rod (16) in a longitudinally free manner; said tie rod (16) being suitable for resisting dual tensile membrane stress acting on each said sailcloth (14), and keeping, 10 during use, each said sailcloth (14) flexible and the corresponding said panel (10) (11) substantially free of tension; each said face (12) (13) having increased wettability, through the application of a Corona treatment, or the like.
- 15 4. Body according to claim 3, characterised in that said tie rod (16) comprises a plurality of fibres (24) free of at least a set material, that are arranged inside one said sheath (15) in such a way as to be longitudinally freely slideable.
- 20 5. Body according to claim 4, characterised in that said sheath (15) has an annular section.
6. Body according to claim 4, characterised in that said sheath (15) has an annular section interrupted at a first panel (10) (11) of the two said panels (10, 11).
- 25 7. Body according to claim 6, characterised in that said sheath (15) is longitudinally delimited by two respective strips (23) that are distinct from one another; said first set panel (10) (11) being suitable, between the two said strips (23), for completing said annular section of said 30 sheath (15), to limit the masses in play and increase their

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flexibility.

8. Body according to claim 6 or 7, characterised in that said sheath (15) and the respective said tie rod (16) comprise fibres (24) with a homogenous composition.

5 9. Body according to claim 6 or 7, characterised in that said sheath (15) and the respective said tie rod (16) comprise fibres (24) with a heterogeneous composition.

10. Body according to claim 6 or 7, characterised in that said tie rod (16) has fibres (24) with a homogenous
10 composition.

11. Body according to claim 6 or 7, characterised in that said tie rod (16) has fibres (24) with a heterogeneous composition.

12. Body according to any preceding claim 8-11,
15 characterised in that the fibres (24) of said sheath (15) and the fibres of the respective said tie rod (16) have sections with a substantially identical value.

13. Body according to any preceding claim 8-11,
characterised in that the sections of the fibres (24) of
20 said sheath (15) and those of the respective said tie rod (16) differ from one another by a set coefficient.

14. Body according to claim 13, characterised in that said coefficient falls within the range 0.20-5.

15. Body according to claim 13, characterised in that said
25 coefficient falls within the range 0.5-2.

16. Body according to claim 13, characterised in that said coefficient falls within the range 0.75-1.5.

17. Body according to any preceding claim, characterised
in that said first set panel (10) (11) has a set shape,
30 said two panels (10, 11) being connected together through

adhesive covering material.

18. Body according to any preceding claim 4-15, characterised in that said free fibres (24) of each said tie rod (16) are organized in the form of roving.
- 5 19. Body according to any preceding claim, characterised in that said first set panel (10) (11) of said pair of panels (10, 11) has a set shape, said two panels (10, 11) being connected together by covering adhesive material (2) suitable to react in a thermoplastic manner.
- 10 20. Body according to claim 19, characterised in that said sheath (15) has an annular section interrupted at a second (11) (10) panel of said pair of panels (10, 11); said second panel (11) (10) being a covering panel of said first panel (10) (11).
- 15 21. Body according to any preceding claim, characterised in that it comprises a plurality of pairs of panels (10, 11), each said pair of panels (10, 11) being delimited at the top and bottom by a first and by a second edge (6, 7).
22. Body according to any preceding claim, characterised in that said free fibres (24) are made from a material chosen from the following products Kevlar, Twaron, Dyneema, carbon, glass.
- 20 23. Sail (1) characterised in that it comprises at least one said membrane body (1) disclosed in claims 1-22, comprising at least one sailcloth (14), delimited by respective side edges (4, 5) converging in a peak (3), and by a base edge (7).
- 25 24. Awning for civil engineering purposes, characterised in that it comprises at least one said membrane body (1) disclosed in claims 1-22.

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25. Method for the construction of membrane bodies, of the type disclosed in claims 1-22; said method comprising a phase of assigning a shape to at least a first adhesive panel (10) (11) of laminated material provided with at 5 least an adhesive face (12) (13); a phase of applying a plurality of flexible longitudinal bodies (15) onto said first adhesive face (12) (13) according to a set pattern; a phase of protecting said flexible longitudinal bodies (15) covering said first face (12) (13) of said first panel (10) 10 (11) with a second panel (11) (10) in such a way that said second panel (11) (10) adheres integrally to said first panel (10) (11); a phase of increasing the adhesive property of said first face (12) (13) of said first panel (10) (11) to fix in position said flexible longitudinal 15 bodies (15) and said first and second panels (10) (11); characterised in that each said flexible longitudinal body (15) is provided with a sheath (15) and inside said sheath (15), with a tie rod (16) comprising a plurality of fibres (24) of a set composition to leave said tie rod (16) free 20 to slide longitudinally in relation to its relative sheath (15) and to said first panel and second panel (10, 11), and able to resist normal stress to free said two panels (10, 11) from membrane stress.

26. Method for the construction of membrane bodies, of the type disclosed in claims 1-22, characterised in that it comprises a phase of assigning a set shape to at least one first panel (10) (11) in laminated material and provided with a first adhesive face (12) (13); a phase of applying a plurality of rovings (25) of free fibres (24) to said first 30 face (12) (13) according to a set pattern; a phase of

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applying a second panel to said first panel to protect each said roving (25), and a phase of subdividing the free fibres (24) of said roving (25) into two distinct portions substantially coaxial to each other, to make a sheath (15)
5 with a first portion of said free fibres (24) and a tie rod (16) with a second portion of said free fibres (24); said sheath (15) being suitable for isolating said tie rod (16) from said first and second panels (10, 11), in such a way as to leave said tie rod (16) free to slide longitudinally
10 in relation to said first panels and second panels (10, 11) and to resist normal stress to free said two panels (10, 11) from membrane stress.

27. Method according to claim 26, characterised in that said phase of presenting the phase of stably connecting
15 said tie rods (16) to at least one of said edges (4, 5, 7) said first and second panels (10, 11) through respective end portions (17, 18) of said tie rods (16).

28. Method according to claim 27, characterised in that it comprises the phase of protecting said roving (25), is
20 followed by a phase of stably connecting together said first and second panels (10, 11) and of making stable the positioning of said rovings of free fibres (24) between said two panels (10, 11) in an adhesive manner through the application of pressure.

25 29. Method according to claim 28, characterised in that said phase of stably connecting said first and second panel (10) (11) is performed inside a vacuum bag through the delivery of heat.

30 30. Method for the construction of sails disclosed in claim 23 and comprising at least one sailcloth (14),

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- delimited by respective side edges (4, 5) converging in a peak (3), and by a base edge (7); characterised in that it comprises a phase of assigning a set shape to at least one first panel (10) (11) in laminated material and provided
- 5 with a first adhesive face (12) (13); a phase of applying a plurality of rovings (25) of free fibres (24) to said first face (12) (13) according to a set pattern; a phase of applying a second panel to said first panel to protect each said roving (25), and a phase of subdividing the free
- 10 fibres (24) of said roving (25) into two distinct portions substantially coaxial to each other, to make a sheath (15) with a first portion of said free fibres (24) and a tie rod (16) with a second portion of said free fibres (24); said sheath (15) being suitable for isolating said tie rod (16)
- 15 from said first and second panels (10, 11), in such a way as to leave said tie rod (16) free to slide longitudinally in relation to said first panels and second panels (10, 11) and to resist normal stress to free said two panels (10, 11) from membrane stress.
- 20 31. Method according to claim 30, characterised in that said phase of presenting the phase of stably connecting said tie rods (16) to at least one of said edges (4, 5, 7) said first and second panels (10, 11) through respective end portions (17, 18) of said tie rods (16).
- 25 32. Method according to claim 31, characterised in that it comprises the phase of protecting said roving (25), is followed by a phase of stably connecting together said first and second panels (10, 11) and of making stable the positioning of said rovings of free fibres (24) between
- 30 said two panels (10, 11) in an adhesive manner through the

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application of pressure.

33. Method according to claim 32, characterised in that said phase of stably connecting said first and second panel (10) (11) is performed inside a vacuum bag through the
5 delivery of heat.

34. Method according to any one of claims 25-33, characterised in that said phase of increasing an adhesive property of said first face (12) (13) is preceded by the phase of distributing an adhesive material (2) on said
10 first face (12) (13).

35. Method according to any one of claims 26-34, characterised in that said phase of subdividing the free fibres (24) of said roving (25) into two parts to make a sheath (15) with a first portion of said free fibres (24)
15 and a tie rod (16) with a second portion of said free fibres (24) is implementable through the delivery of heat to the adhesive material (2).

36. Method according to any one of claims 26-34, characterised in that said free fibres (24) are made from a
20 material chosen from the following products Kevlar, Twaron, Dyneema, carbon, glass.

37. Method according to any one of claims 34-36, characterised in that said adhesive material (2) selectively comprises an acrylic or rubber resin compound
25 or a copolymer similar to PET.

38. Method according to claim 37, characterised in that said acrylic compound is in the form of a gel.

39. Method according to any one of claims 30-38, characterised in that said phase of stably connecting said
30 tie rods (16) to said first and second panels (10, 11)

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through respective end portions (17, 18) of said tie rods (16) is performed through heat.

40. Method according to any one of claims 30-38, characterised in that said phase of stably connecting said 5 tie rods (16) to said first and second panels (10, 11) through respective end portions (17, 18) of said tie rods (16) is performed cold.